CONDUIT SHORTENING ADJUSTMENT ASSEMBLY

TECHNICAL FIELD

The subject invention relates to a motion transmitting remote control assembly of the type for transmitting motion in a curved path by a flexible motion transmitting core element movably supported in a conduit.

BACKGROUND OF THE INVENTION

Such remote control assemblies are used in automobiles to control heaters, vents, accelerators, throttles, parking-brake interlocks, etc. The length of the conduit must be adjustable during installation as the routing and distance between the connection points varies. A manually adjustable assembly is one wherein the length of the conduit changes as two telescoping members interconnect the ends of the conduit and move longitudinally relative to one another during installation to the adjusted position whereupon a locking member is moved to a locking position to interlock the two telescoping members to prevent any change in the length of the conduit. Examples of such assemblies are shown in U.S. Pat. Nos.: 3,572,159 to Tschanz; 4,117,691 to Fillmore; 5,161,428 to Petruccello; and 5,178,034 to Keasoner, all assigned to the assignee of the instant invention. An important attribute of such assemblies is that they include a spring which biases the telescoping members apart whereby the outward ends of the conduit are moved in the overall conduit shortening direction during installation just before the overall length of the conduit is fixed.

SUMMARY OF THE INVENTION AND ADVANTAGES

A motion-transmitting remote control assembly of the type for transmitting motion along a curved path by a flexible core element movably supported in first and second conduit sections and adjustment components interconnecting the first and second conduit sections for adjusting the overall length of the first and second conduit sections. The assembly is characterized by a spring interacting with the adjustment components to bias the components together to shorten the overall length of the first and second conduit sections.

In many installation situations it is desirable to increase the overall length of the conduit during the installation. This is accomplished by the subject invention wherein the telescoping members are biased into one another in the overall shortening direction instead of being biased apart as is prevalent in the prior art assemblies.

BRIEF DESCRIPTION OF THE DRAWINGS

Other advantages of the present invention will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawings wherein:

FIG. 1 is a perspective view of a preferred embodiment of the subject invention;

FIG. 2 is cross sectional view taken substantially along line 2—2 of FIG. 1;

FIG. 3 is a cross sectional view taken along line 3—3 of FIG. 1;

FIG. 4 is an exploded perspective view of the preferred embodiment;

FIG. 5 is a cross sectional view similar to FIG. 2 but showing the assembly in the shipping position;

FIG. 6 is a side elevational view of the male member of the preferred embodiment; and

FIG. 7 is a cross sectional view taken along line 7—7 of FIG. 3.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the Figures, wherein like numerals reference like or corresponding parts throughout the several views, a motion transmitting remote control assembly constructed in accordance with the subject invention is generally shown at **10**. The motion transmitting remote control assembly **10** is of the type for transmitting motion in a curved path by a motion transmitting core element **12**. The core element **12** is generally a wire or a plurality of stranded wires. The core element may also be divided into two parts along with the remainder of the assembly **10** and therefore include a connector for connecting the two core sections together, although such a connector is not shown many are well known in the art.

The assembly also includes first and second conduit sections. In the embodiment illustrated, the conduit sections include first **14** and second **16** conduits of the type well known in the art comprising an inner tubular member made of plastic and surrounded by wires or filaments helically disposed on a long lead angle with a plastic casing extruded about the long lay wires. The overall conduit includes the male fitting or first member **18** on the end of the first conduit section **14** and the female fitting or a second member **20** on the end of the second conduit section **16**. The members **18** and **20** are made of plastic and molded about the respective ends of the conduit sections **18** and **20**. It is to be understood that the subject invention may be implemented in assemblies which do not include the tubular flexible conduit sections, i.e., only the male and female members **18** and **20**.

However, in the preferred embodiment the male and female members **18** and **20** define telescoping adjustment components interconnecting the first **14** and second **16** conduit sections for adjusting the overall length of the first and second conduit sections, i.e., the overall length of the conduit regardless of its makeup. The telescoping adjustment components include a locking member **19**. The male member **14** includes adjustment teeth **21** therealong and the locking member **19** is supported by the female member **16** for engaging the teeth **21** in a locked position to prevent relative telescoping movement between the telescoping members **14** and **16**. The locking member **19** is U-shaped with teeth **23** on the interior of the legs for engaging the teeth **21** on the male member **14**. Hooks **25** are disposed at the distal ends of the legs and detent recesses **27** are disposed in the female member **16** for engaging the hooks **25** in an intermediate position out of engagement with the teeth **21**. The female member **16** also presents catches **28** for engaging and retaining the hooks **25** to lock the locking member **19** in the locked position, as shown in FIG. 2. The locking member **19** includes a cap which engages the top of the female member **16** to limit the inward locking movement of the locking member **19**.

This assembly **10** is characterized by a spring **22** interacting with the male and female adjustment components **18** and **20** to bias the components **18** and **20** together to shorten the overall length of the first and second conduit sections **14** and **16**, a retainer **24** is disposed on one of the telescoping members during assembly thereof for retaining the spring **22**

in compression; more specifically, the retainer is a projection on the male member **18**. The spring **22** is a coil spring spiraled or helically disposed around the male member **18**. An abutment is presented or defined by the locking member **19** for reacting with the end of the spring **22** in place of the retainer **24** upon assembly of the male **18** and female **20** telescoping members so that the telescoping members **18** and **20** are biased together in the direction to shorten the overall length of the conduit sections **14** and **16**. An annular collar or ring **26** reacts axially between the retainer **24** and the end of the spring **22** during assembly and reacts between the spring **22** and the locking member **19** during adjustment of the overall length of the conduit sections **14** and **16**. The collar **26** is spilt for radial expansion as it is forced over the retainer projection **24** during assembly of the spring and collar onto the male member **18**. The collar is normally biased to closely engage the exterior of the male member **18**.

The locking member **19** includes a tunnel **30** extending therethrough and the retainer projection **24** could be disposed on the opposite side of the member **18** in which case it would be movable through the tunnel **30** during telescoping movement of the male **18** and female **20** members in the conduit lengthing direction to allow the abutment on the locking member **19** to react with the collar and therefore the spring.

The male member **18** defines an inner end **32** and the female member **20** presents a bottom end wall **34**. The inner end **32** of the male member **18** is adjacent the bottom end wall **34** when the male member **18** is fully inserted into the female member **20** to define the shortest overall length of the conduit sections **14** and **16**. As the retainer **24** presents a reaction surface for reacting with the collar **26**, the reaction surface is axially spaced toward the bottom end wall **34** from the abutment presented by the locking member **19** when the inner end **32** of the male member **18** is adjacent the bottom end wall **34** of the female member **20**. This is accomplished by a pillar **36** extending into the female member **20** from the bottom end wall **34** thereof. The pillar **36** has a bore therethrough and the core element **12** extends through the bore in the pillar **36**. The male **18** and female **20** members include complementary keyways **38** and **40** for rotary orientation of the male member **18** relative to the female member **20** to align the retainer projection **24** witin the locking member **19**. The keyways **38** and **40** extend axially along the exterior of the pillar **36** and the interior of a bore into the end **32** of the male member **18**. Furthermore, the male member **18** presents an internal limit surface **42** for engaging the inner conical end of the pillar **36** to limit the insertion of the male member **18** into the female member **20** to define the shortest overall length of the conduit.

Additionally, the male member **18** includes a sealing length adjacent the inner end **32** thereof in sliding engagement with the interior of the female member **20** and a reduced cross section defining a spring seat **44** therebetween. The spring **22** reacts between the spring seat **44** and the collar **26**. An o-ring seal **46** seals the sealing length of the male member **18** and the interior of the female member **20**.

Prior to shipment, the spring **22** is radially resilient enough to be forced over the retainer projection **24** and into engagement with the spring seat **44**. The collar **26** follows the spring **22** and snaps over the retainer projection **24**. The spring is in compression to react between the seat **44** and the collar **26** and is retained in this position as the male member **18** is inserted into the female member **20**. The male member **18** is inserted into the female member **20** until the conical end of the pillar **36** abuts the tapered complementary surface **42** on the interior of the male member **18**. In other words, the